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LOSSES OCCURRING IN THE STORAGE OF POPPY (PAPAVER SOMNIFERUM) STRAW

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1/ This ST/SOA/SER.J/.. series of documents was previously entitled "Scientific research on Papaver bracteatum".

General note: The views expressed by collaborating scientists in their contributions to the programme are not necessarily shared by the Secretariat.

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INTRODUCTION

Deterioration in stored products frequently occurs without detection, and the extent of loss in quality is seldom realized. The deterioration may begin before harvesting, when the plants are ripening. Bacteria, fungi, insects, rodents, etc., may attack various parts of the plant. Also, quality may be affected by the methods of harvesting, separation and handling, while storage conditions may induce losses by micro-organisms and chemical changes in the products.

Stages at which losses occur

Losses can take place at any of the different stages through which poppy straw passes on its journey from the fields to the extraction plant. It undergoes deterioration during growth; while awaiting harvesting, and after it has been harvested; in transport vehicles in which it is; and in the warehouse during handling and storage (separation of the seeds, preparation of compressed bales of straw, etc.)

The purpose of this study was to determine whether losses in weight and in alkaloids occur after the straw has been collected and processed for storage. Losses caused by methods of harvesting, transport, etc. will be the subject of other investigations.

Losses in weight

Losses in weight of capsules result from the evaporation of moisture and the quantity destroyed by insects, diseases and rodents, and by spillage during transport and storage. Losses from drying of capsules following harvest vary from 10% to 40% depending on their stage of maturity, weather conditions and method of harvest, i.e. hand picking vs combining.

Losses in the stored products caused by rodents are of two main kinds:

(a) Once the capsules have been picked, rodents can consume huge quantities of the seeds, although not of the straw. If the capsules have been picked when they are whole and still contain seeds, the rodents make holes in them to reach and eat the seed.

(b) When the straw has been separated from the seed, the usual practice is to store the latter in jute sacks. These can be burrowed into by rodents, causing enormous losses. Consequently,

it is recommended that the seeds should be stored in bulk after cleaning. This provides less shelter for the rodents.

Losses in alkaloids

It is logical to assume that the phenanthrene alkaloids in the stored poppy straw will deteriorate in the course of time through the action of such factors as humidity, atmospheric oxygen, temperature, method of processing to reduce bulk, etc.

After the poppy straw has been separated from the seed, it is desirable to process it by some method to reduce its bulk. Only "mini-packing" and granulation of capsules will be considered in this paper in reference to their effect on the degradation of alkaloids. These are the two aspects we shall try to study with a view to establishing methods of operation calculated to produce as little loss as possible.

In order to determine the quantitative losses of alkaloids, the following plan of work was adopted:

One kg of capsules without seed was taken from each of two varieties: Papaver somniferum variety celtibericum and a control variety of Papaver somniferum UNS 37. In turn, each sample was divided into two sub-samples and identified as A and B.

Sample A - The capsules were pulverized and divided into three parts, each of which was kept under different conditions: A-1, ambient conditions; A-2, at 4°C; A-3, inert atmosphere and room temperature.

The samples were further divided into five parts for analysis at specific time intervals.

Sample B - Each whole capsule was divided into three parts so that the sub-samples would be similar. Each of the three parts was stored under one of the following conditions after being divided into five parts for analysis at specific time intervals. B-1, ambient conditions; B-2, at 4°C; B-3, inert atmosphere and room temperature.

RESULTS

Results of analyses made on the several dates are given in table 1, and shown in graph form in the attached figures.

With regard to the possible losses of alkaloids resulting from a reduction in the volume of straw, the morphine content of the straw before and immediately after handling was determined by means of two different processes: granulation and mini-packing.

	Granulation		Mini-packs	
	Before	After	Before	After
Morphine	0.368 % 2/	0.366 %	0.42 %	0.418 %

TABLE 1

	Morphine content				
	April	June	August	October	Total losses
Mini-packing	0.42	0.41	0.42	0.39	0.03
Granulation	0.36	0.35	0.34	0.35	0.01

CONCLUSIONS

After reviewing the results of the analyses, we can confirm that there is a loss in morphine content in every case (see figures at the end of the paper).

It would seem that the best method of storage is to keep the straw in as coarse a state as possible.

Any method of handling involving finer grinding will inevitably increase the loss of alkaloids.

Very little degradation of the alkaloid content takes place with the methods we have been using to reduce the volume of the straw.

2/ Figures are the mean for three analyses of each sample. To ascertain whether there were variations in the amount of alkaloids lost during the storage of these two types of compressed product they were kept in storage and analysed at regular intervals (see Table II).

TABLE II

Morphine content of "mini-packed" and ground opium poppy capsules stored under three conditions and analyzed over an eight-months' period

	Date of analyses and morphine content as a % of dry weight				
	31.1.77	2.5.77	4.7.77	5.9.77	Loss of alkaloids
	%	%	%	%	
P. somniferum var. celtibericum					
Powder at room temperature	2.00	1.90	1.94	1.89	0.11
Powder at 4°C	1.84	1.82	1.84	1.79	0.05
Powder in CO_2	1.94	1.93	1.83	1.85	0.09
Capsule at room temperature	1.82	1.82	1.82	1.83	----
Capsule at 4°C	1.82	1.82	1.79	1.75	0.07
Capsule in CO_2	1.82	1.81	1.83	1.83	----
P. somniferum - UMS 37					
Powder at room temperature	0.43	0.40	0.40	0.40	0.03
Powder at 4°C	0.41	0.40	0.39	0.39	0.02
Powder in CO_2	0.42	0.39	0.39	0.39	0.04
Capsule at room temperature	0.40	0.37	0.37	0.38	0.02
Capsule at 4°C	0.41	0.40	0.41	0.39	0.02
Capsule in CO_2	0.43	0.41	0.37	0.37	0.06

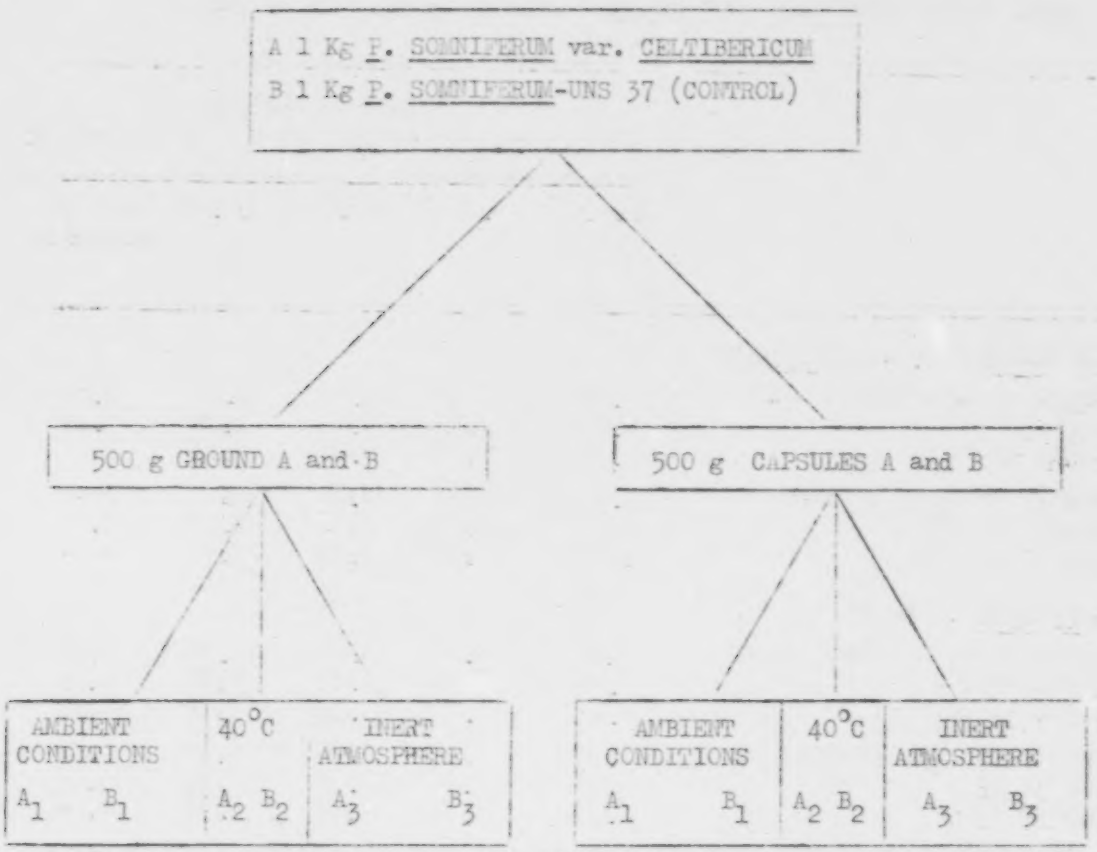

Figure 1 - Diagram of research with opium poppy straw to determine the effect of pre-storage processing and storage environment on phenanthrene alkaloid content.

Figure 2 - Changes in morphine content of P. somniferum var. celtibericum when capsules are pulverized and stored in different environments.

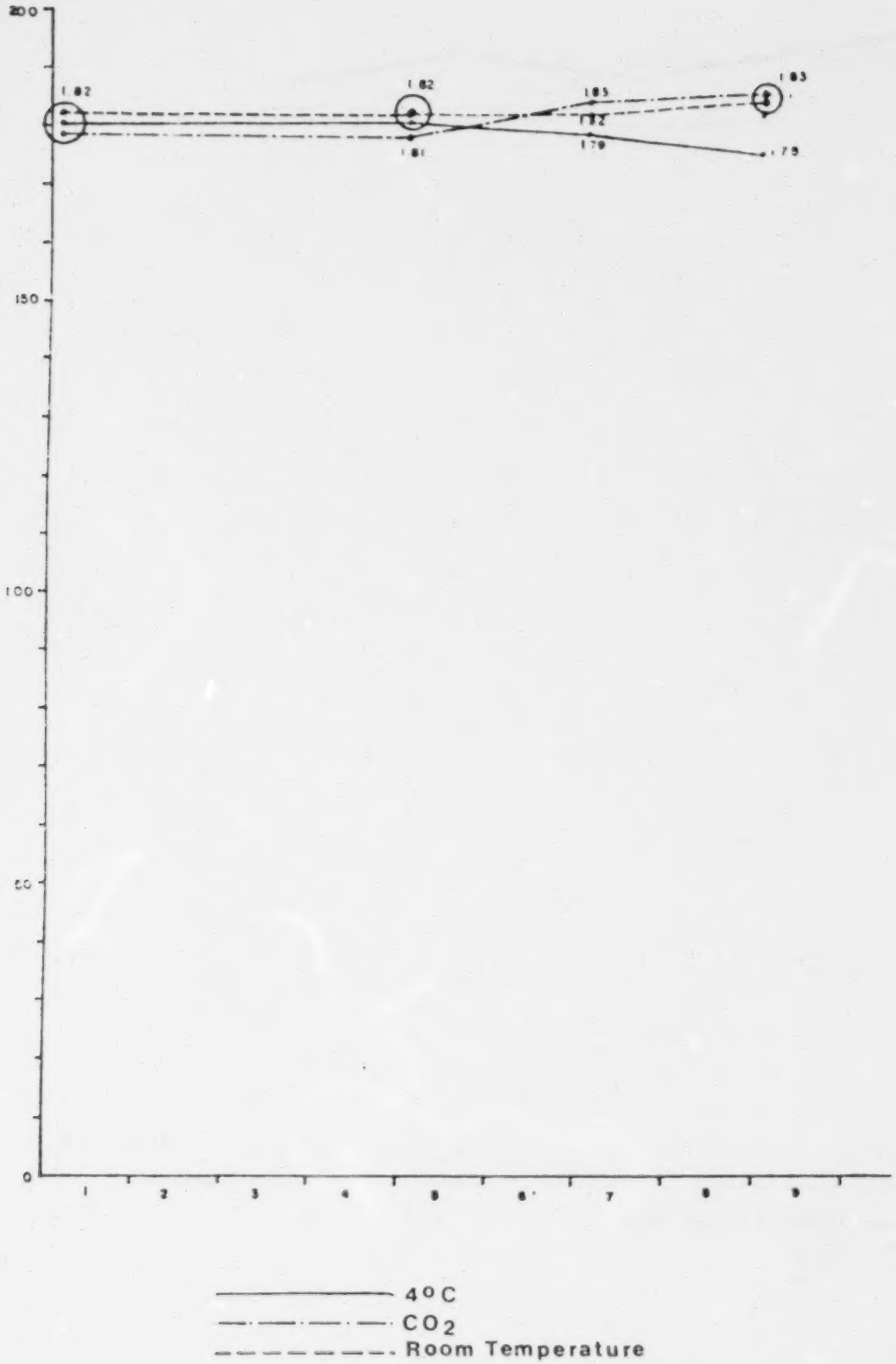

Figure 3 - Changes in morphine content of P. somniferum var. celtibericum when capsules are compacted as "mini-pack" and stored in different environments.

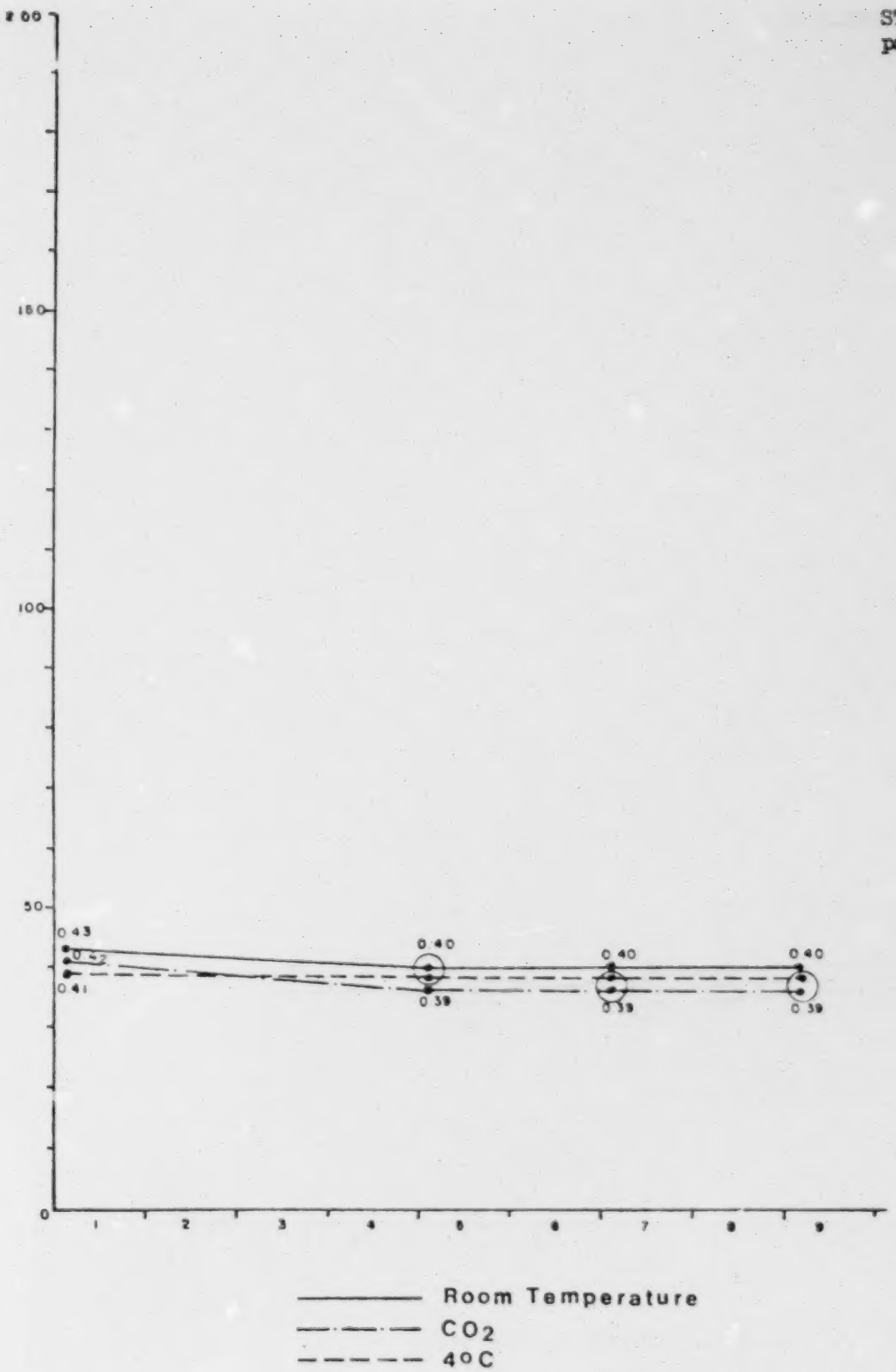

Figure 4 - Changes in morphine content of P. somniferum - UNS 37 when capsules are pulverized and stored in different environments.

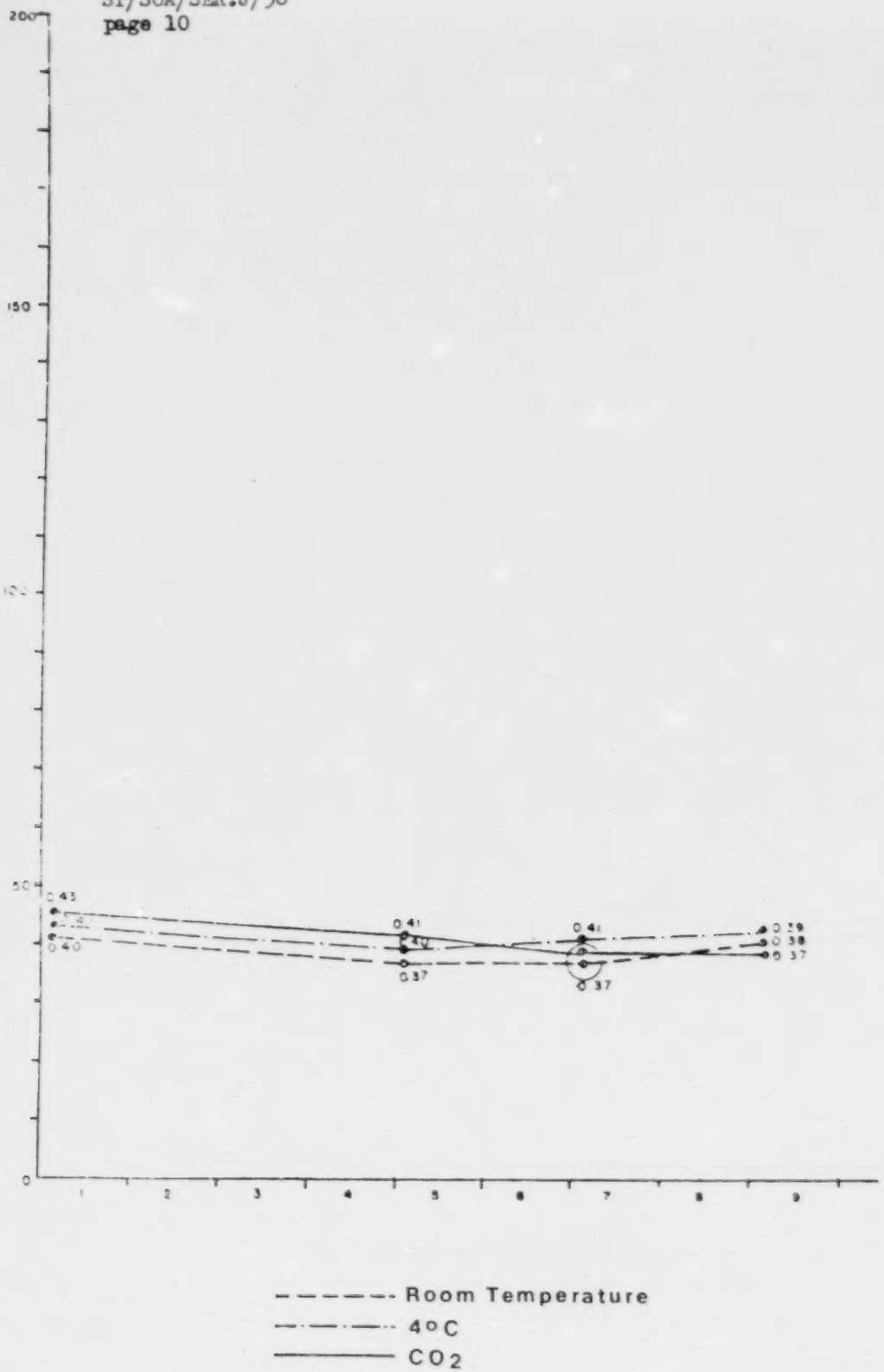

Figure 5 - Changes in morphine content of P. somniferum - UNS 37 when capsules are compacted as "mini-packs" and stored in different environments.

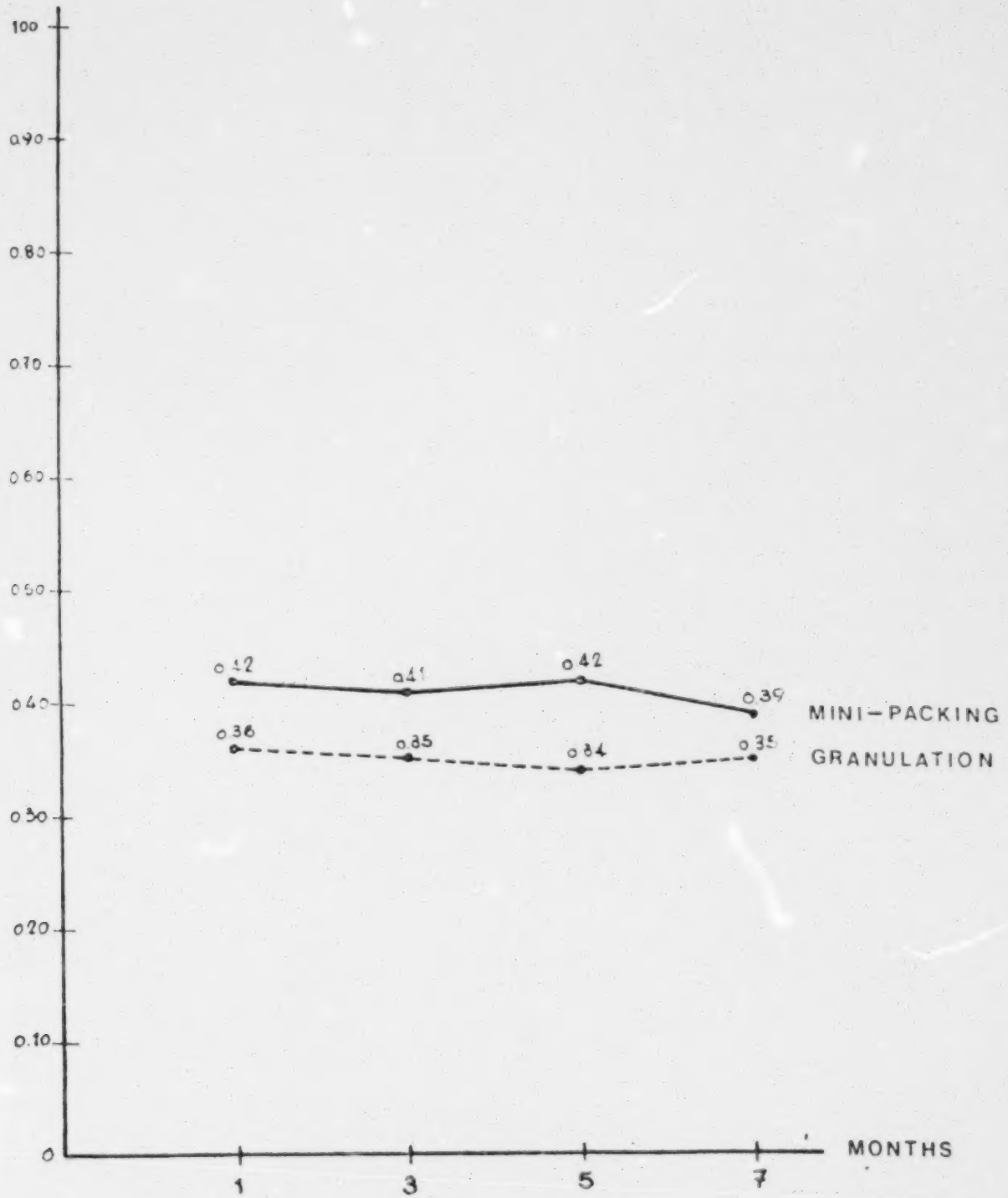

Figure 6 - Comparison of morphine content in poppy straw stored as pulverized powder and compressed "mini-pack".